# Toward MPEG’s vision of immersive experiences

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# What is virtual reality?

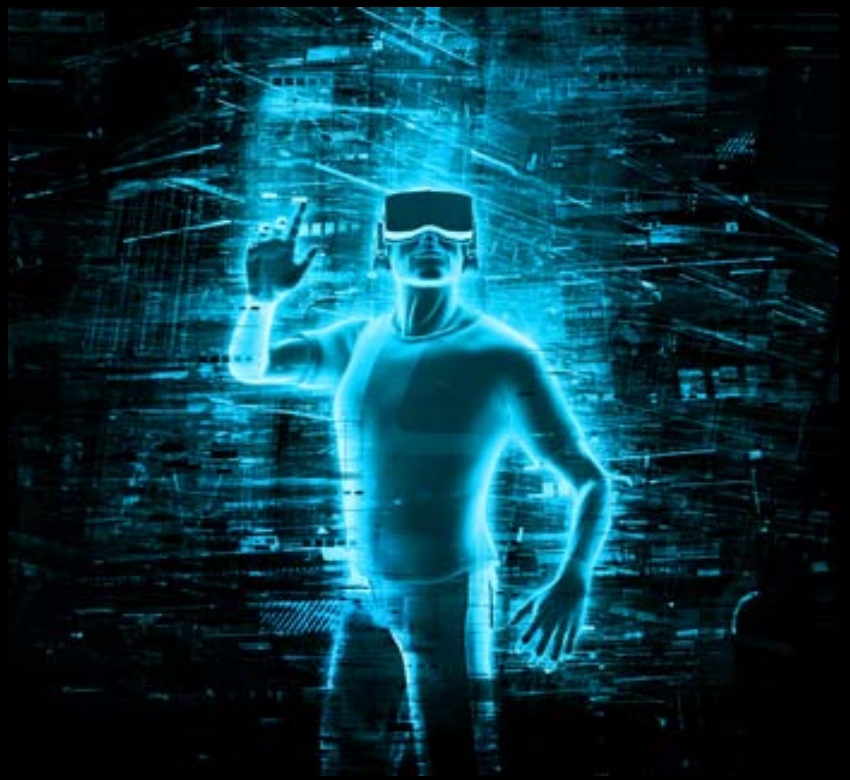
*Virtual Reality is a rendered environment (visual and acoustic, pre-dominantly real-world) providing an immersive experience to a user who can interact with it in a seemingly real or physical way using special electronic equipment (e.g. display, audio rendering and sensors/actuators)**

**MPEG's definition*

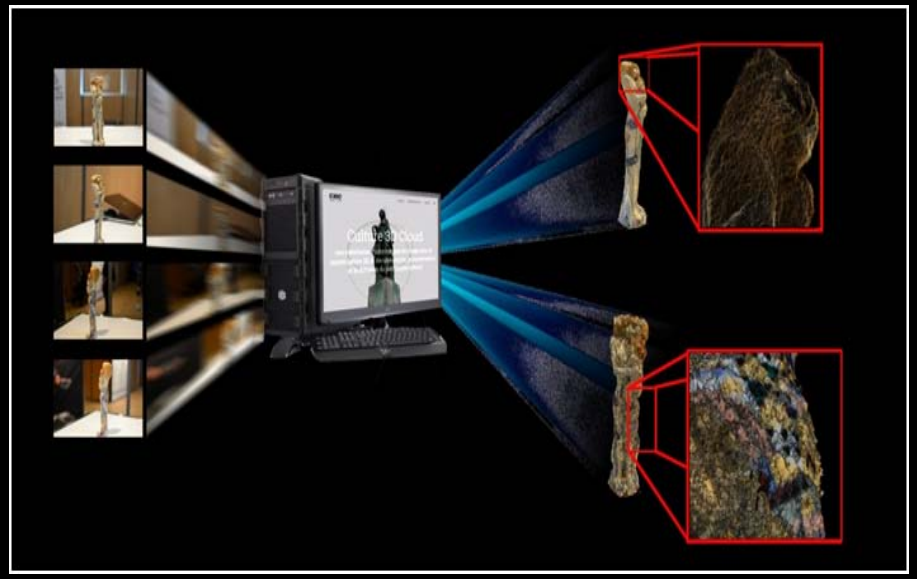
# Elements of VR from MPEG point of view

# 360° degree video

- Single view
- Stereoscopic + 3 DoF
- Multiple view with continuous parallax + 6 DoF

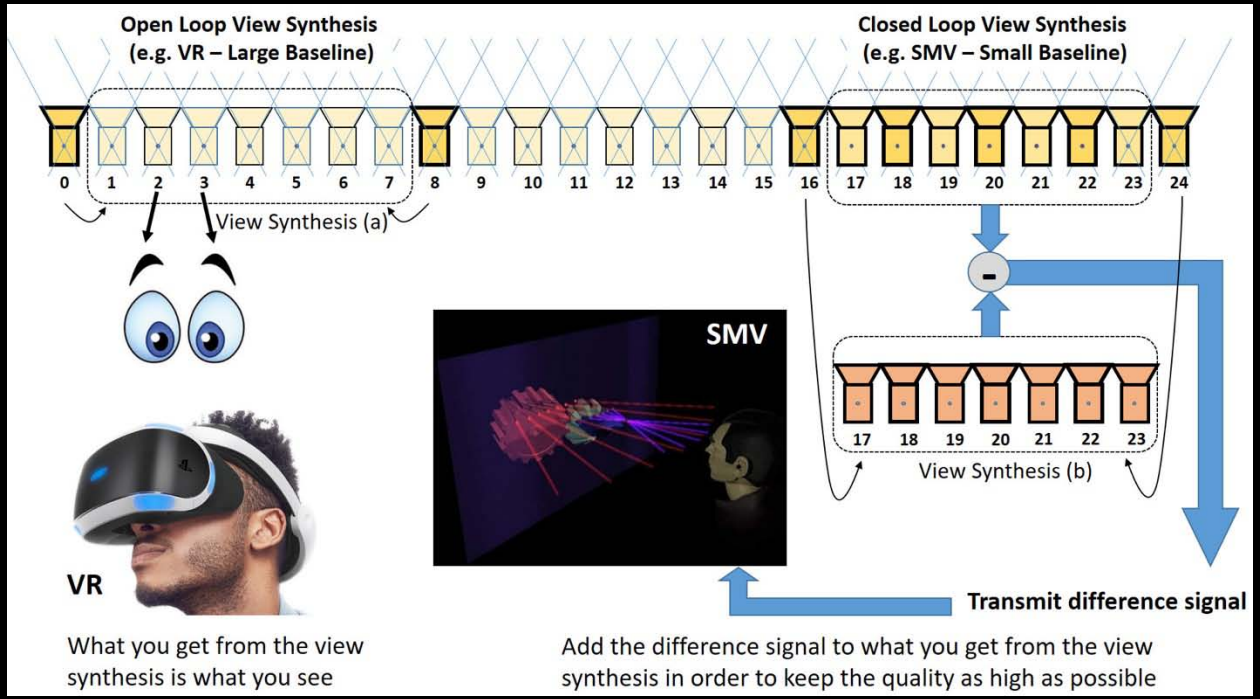


# Point clouds



- Natural and computer generated content, 3D meshes
- Efficient compression for storage, streaming, and download
- CfP to be issued Jan 2017

# Free navigation

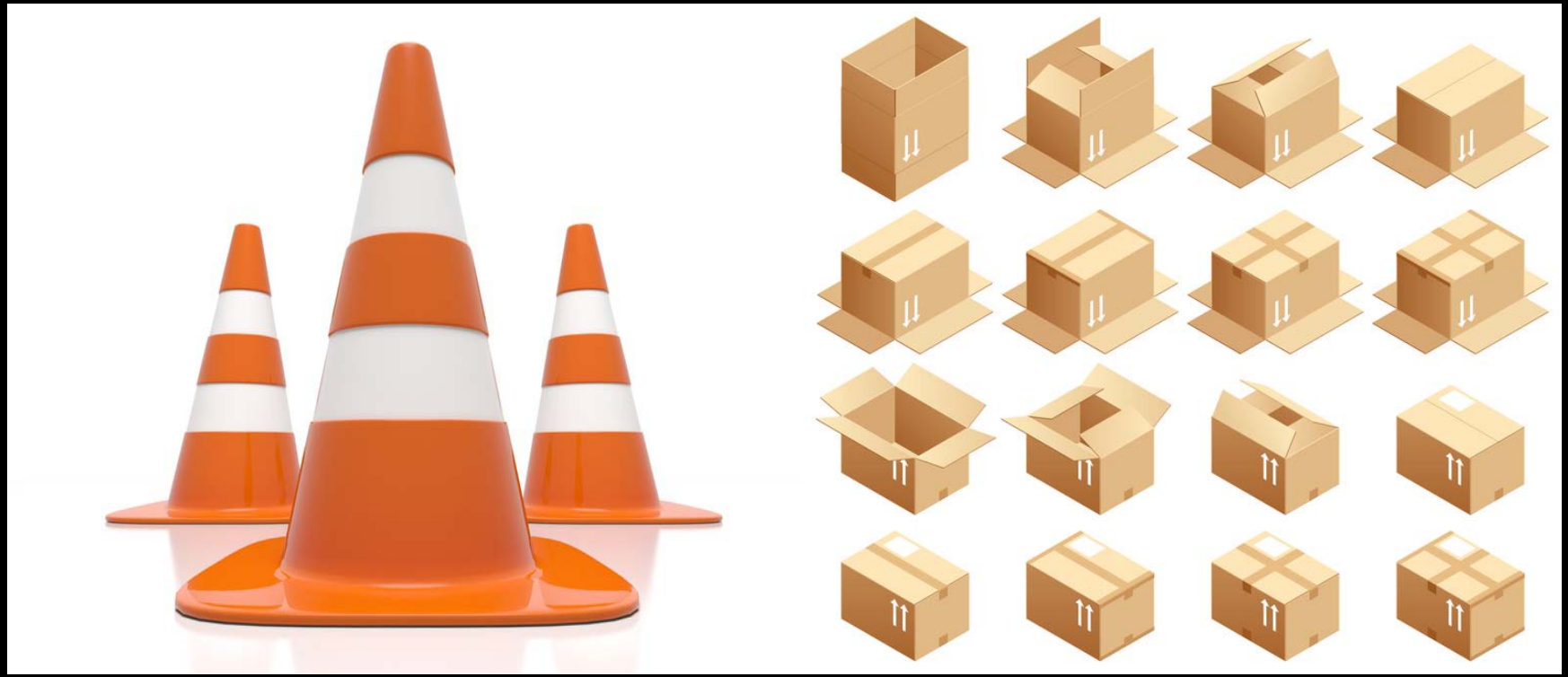



- Capture of converging or diverging views from camera arrays
- Viewer can freely choose the desired view

# Immersive audio

- Projection of audio waveforms in more natural way
- Listener receives audio signal coherent with his/her position

# Signaling and carriage of a/v media



# Who and what is MPEG

# MPEG

- Organized under ISO/IEC
- Some joint work with ITU-T, e.g. HEVC
- Participants are accredited by their national organization, i.e. country
- Development of specifications follows a due process structure; voting conducted by country
- Usually meets 3-4 times per year; roughly 400 experts attend each meeting

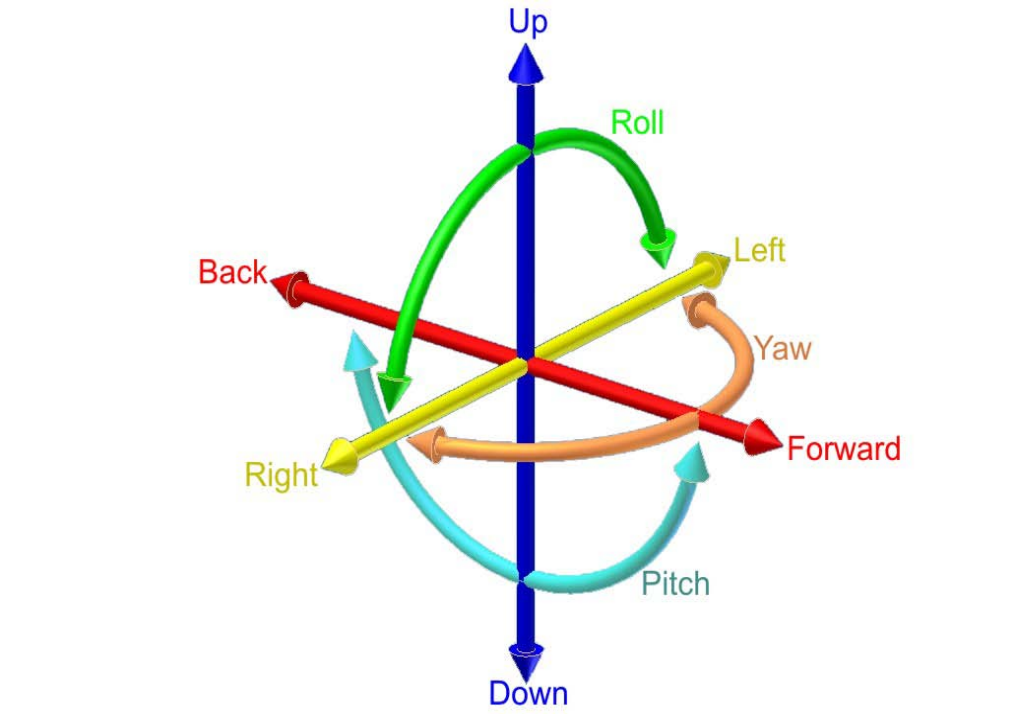
# Toward MPEG’s vision of virtual reality

# Work already underway or completed

- DASH extensions for streaming VR and signaling ROI
- HEVC enhanced for flexible tiling
- Experiments for 360° stereo + 3 DoF video
- Audio completed for 3 DoF
- Experiments for free navigation
- Experiments for many formats of projection mappings and necessary signaling

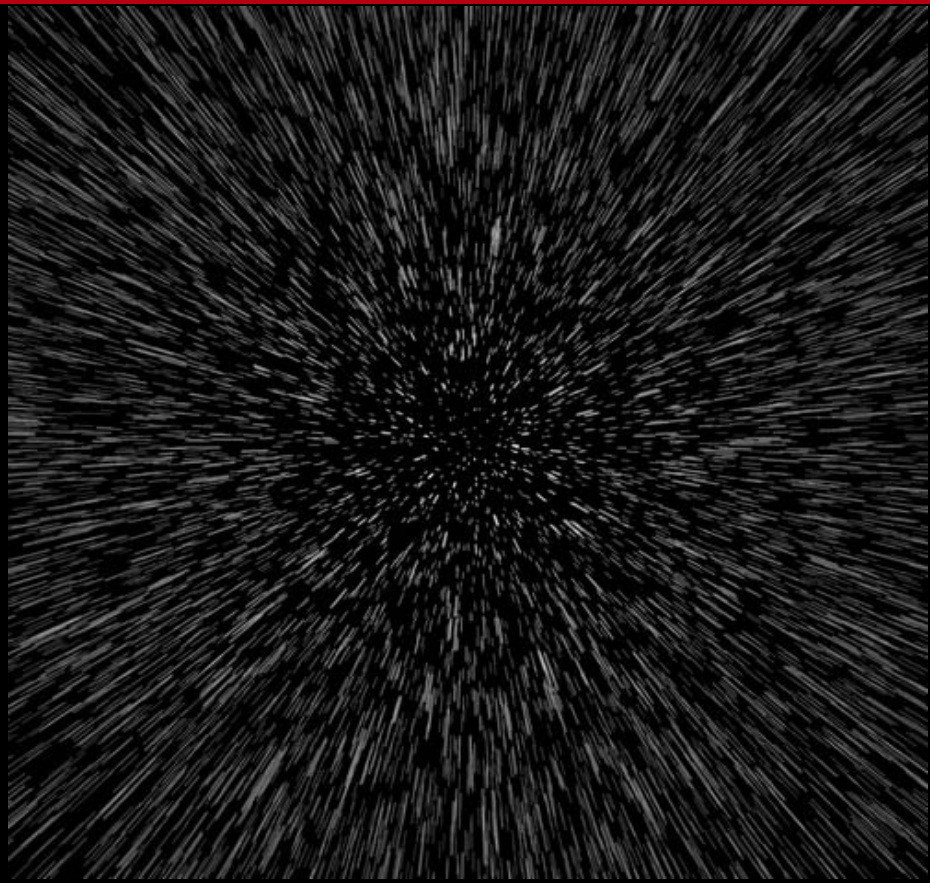
# Six degrees-of-freedom

- Part of MPEG's vision for *native VR*
- What technology?
  - Light Fields?
  - Point Clouds?
  - Could depend on use case
- May require entirely new video codec (TBD)
- Point cloud activity already underway



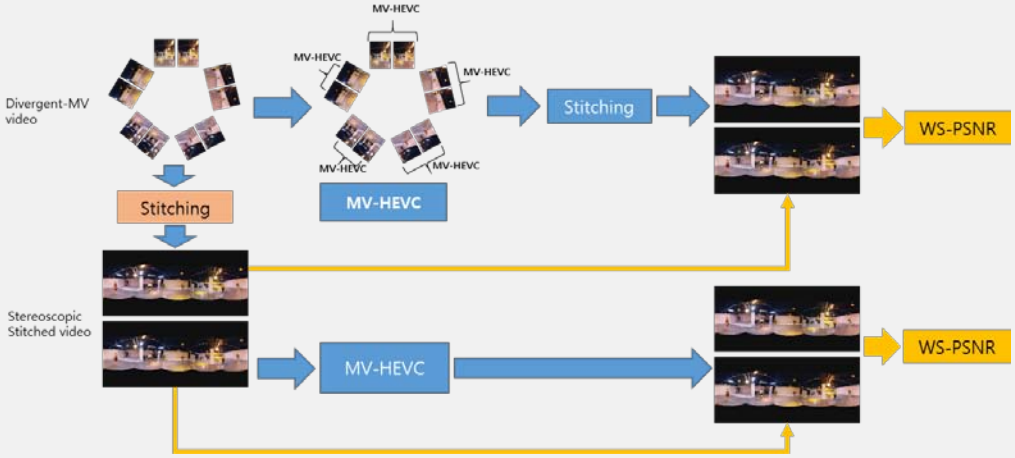
# Goals and devices for light fields

- Future light field head mounted displays
- Free navigation, e.g. sporting events
- Full coherent parallax
- Super multi-view display or light field display



# Next steps for light field video

- Free navigation experiments with various camera array configurations
- Testing with plenoptic video and highly dense camera array video test material
- One solution may be to extend JPEG Pleno's support of static light field images
- Consider viewer fatigue, motion sickness, eye strain, coherent sensory fusion



# Conclusion

# MPEG and immersive technologies for VR

- Good progress
- Short term focus on 360° video with 3 DoF
- Long term 6 DoF video
- Point cloud work underway
- More info @ http://mpeg.chiariglione.org